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A63F 9/08

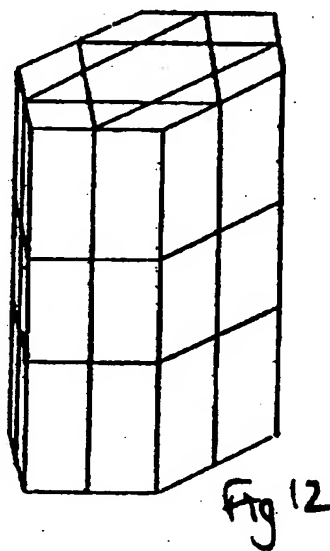
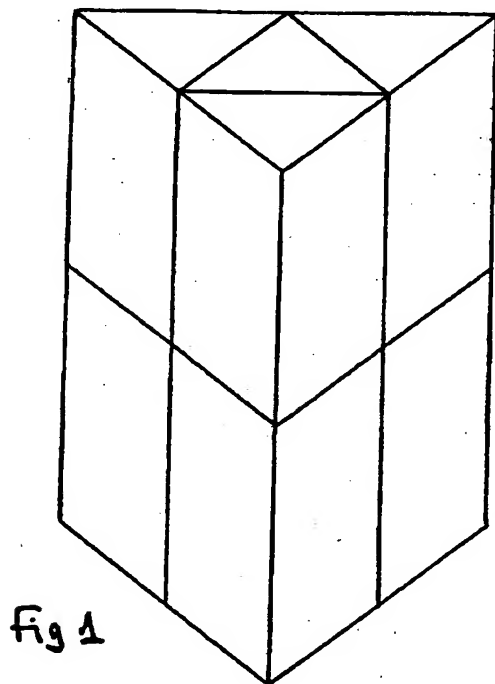
(52) UK CL (Edition O)
A6H HKD

(56) Documents Cited
US 4867961 A US 4586713 A

(58) Field of Search
UK CL (Edition N) A6H HKD
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(54) Puzzles

(57) Moving block puzzles are described in which the blocks are assembled together but columns of two or more blocks can be twisted around their centres to "shuffle" the blocks from their original position. The overall shape of the assembled set of blocks is prismatic.



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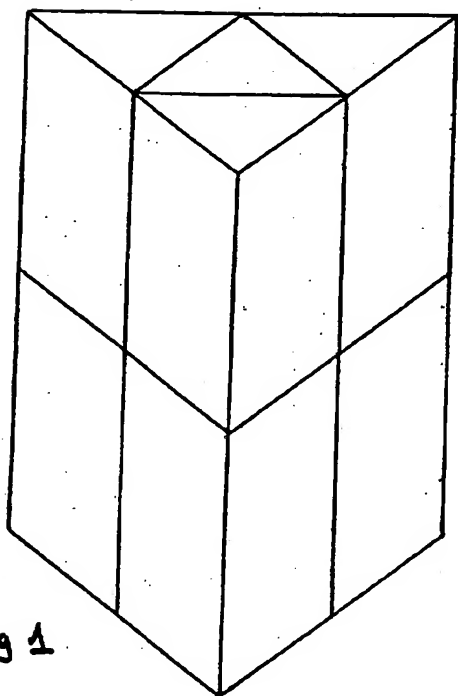


Fig 1

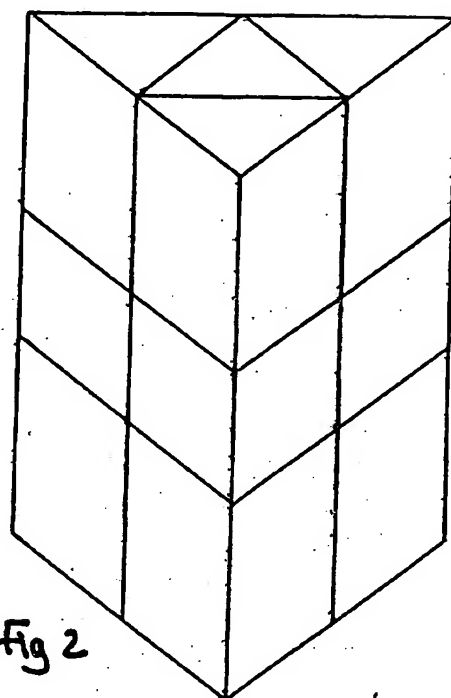


Fig 2

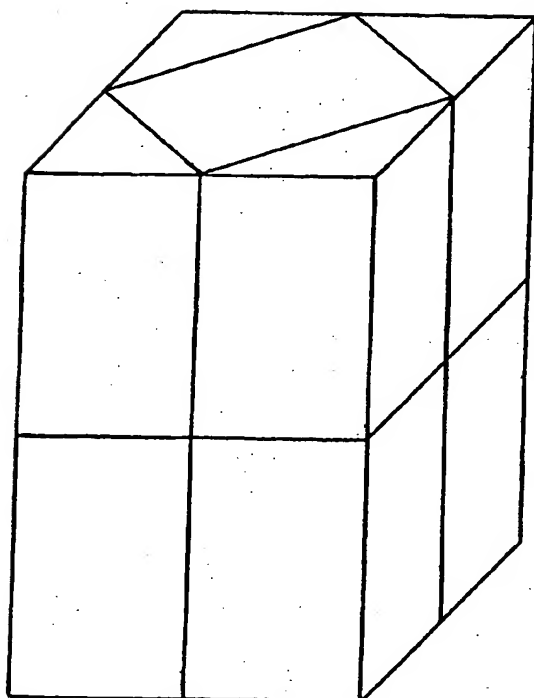


Fig 3

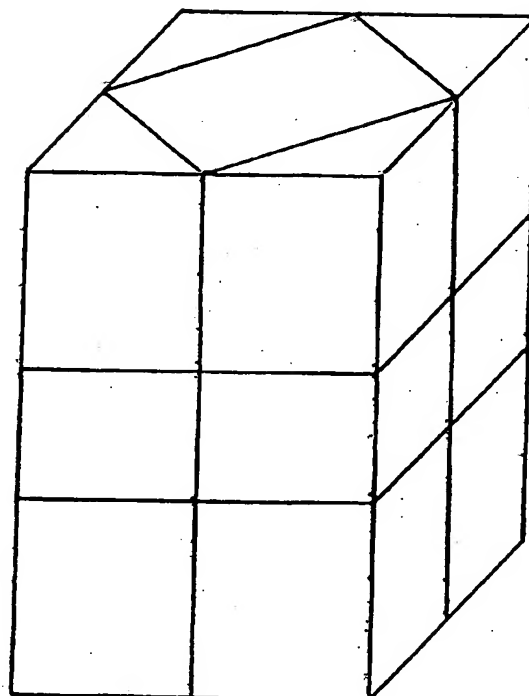
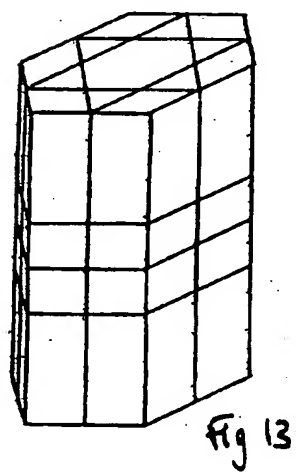
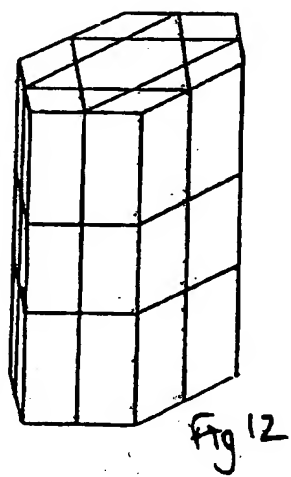
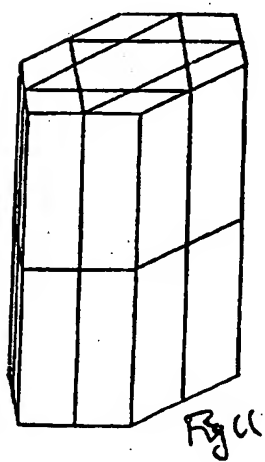
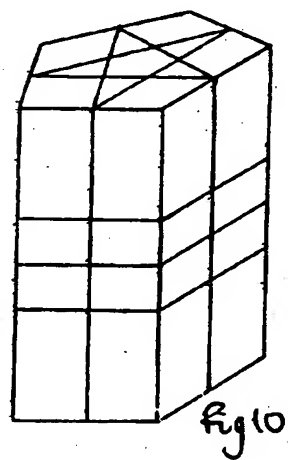
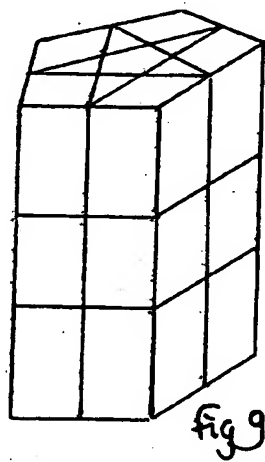
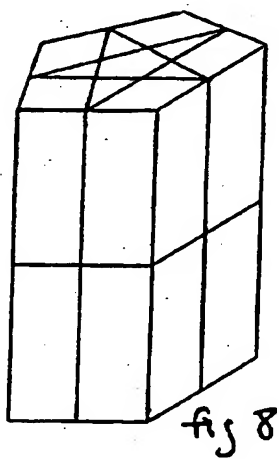
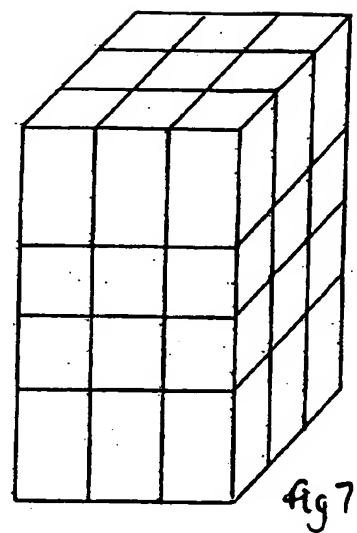
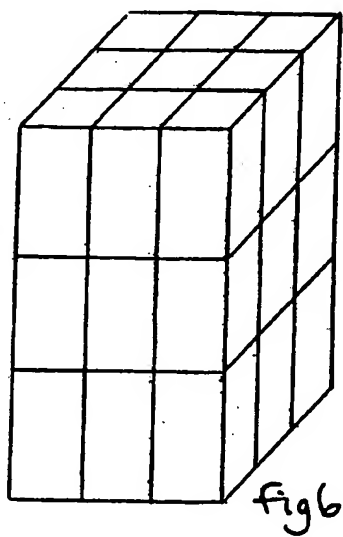
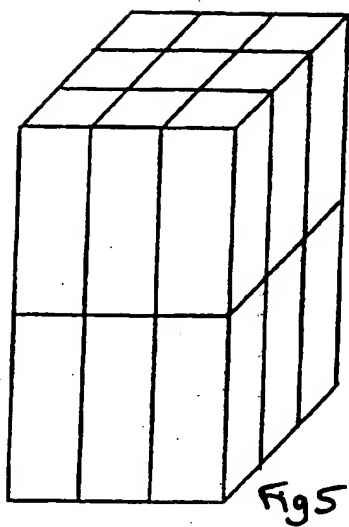


Fig 4

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$\frac{3}{4}$

Fig 14

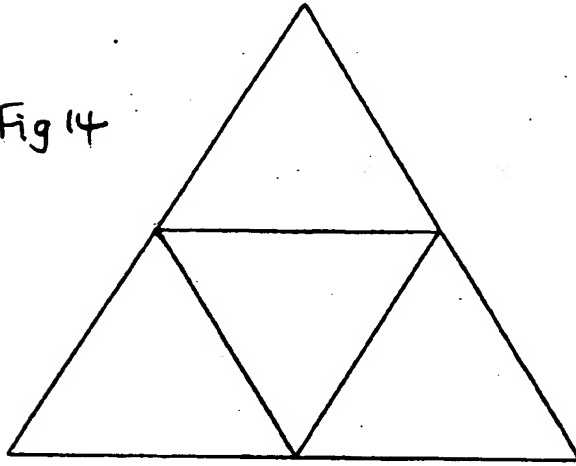


Fig 15

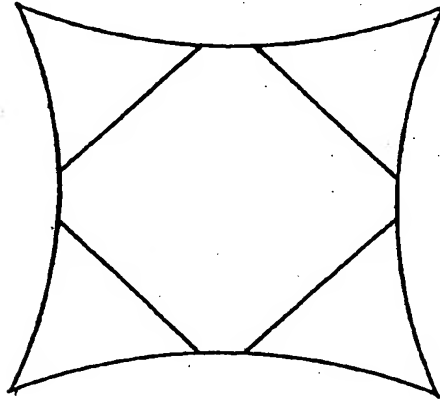
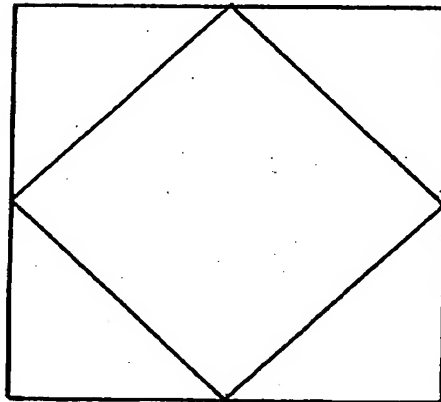


Fig 16



$\frac{4}{4}$

fig 17

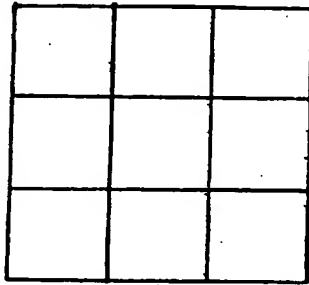


fig 18

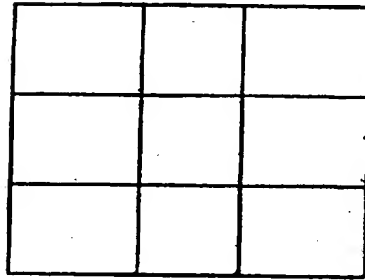


fig 19

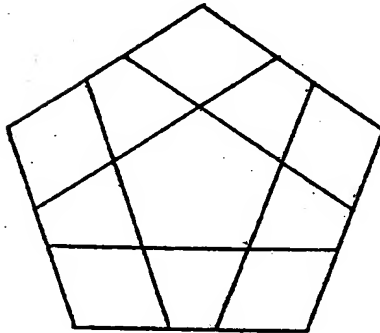
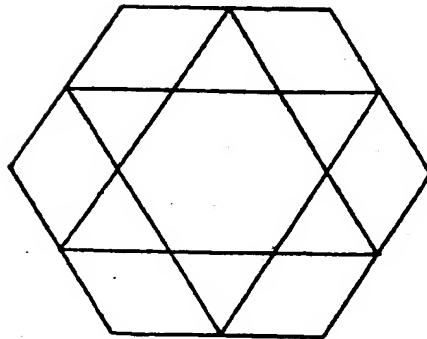


fig 20



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PUZZLES

5 This invention relates to puzzles and particularly to
puzzles formed of a number of blocks assembled
to present an overall unit.

10 In recent years, many such block puzzles have been put on
the market. The designers of these puzzles have
concentrated their efforts on the platonic solids (and
also possibly the semi-regular solids). The most widely
marketed is the so-called "Rubik's Cube", but solid
puzzles in the form of tetrahedrons, cubes, octahedrons
and dodecahedrons are known. Some are described in USP
4415158.

15 According to the present invention, there is provided a
puzzle in the form of a set of mutually captive blocks
arranged to form an overall prismatic shape, wherein the
blocks are arranged in two or more layers, the axis of
20 the prismatic shape passing perpendicularly through such
layers, each layer being rotatable about the axis of the
prismatic shape relative to the adjacent layer(s), and
wherein each layer consists of a central prismatic block
and a plurality of lateral blocks, sets of aligned

lateral blocks being rotatable as a set about an axis perpendicular to the axis of the central prismatic blocks and half way along it, rotation through one or more amounts of 180° only preserving the rotatability of the layers.

Such puzzles are based on the general concept that any right prism (i.e. one thought of as having a vertically extending axis) can be divided into two or more layers by horizontal section planes (i.e. planes perpendicular to the axis of the prism). It can be further sub-divided by vertical section planes (i.e. planes parallel to the axis of the prism).

Thus an original prism may be divided into a number of smaller prisms.

The original prism may be referred to as the parent (or composite) prism, and the smaller prisms may be referred to as the constituent prisms.

In puzzles according to the present invention, in this terminology, the vertical section planes do not pass through (are external to) the axis of the parent prism.

Each horizontal section or layer of the composite prism can be rotated about an axis which is coincident with the axis of the parent (or composite) prism.

Each vertical section (i.e. set of aligned lateral blocks) of the composite prism can be rotated about an axis which is perpendicular to the axis of the parent (or composite) prism.

In this way by successive rotations of the various sections, the constituent prisms can be scrambled creating a different surface pattern to that of the original parent prism.

5

The aim is to scramble the various sections, then try to unscramble them to achieve the original arrangement, which can be identified, as in the case of known puzzles, by different colours on the sides of the composite prism and, if desired, on its ends.

10

The general geometry of the dissected prism can also be thought of as follows:

15

When a parent prism is sectioned as described, the resulting constituent prisms are classified as central prisms and side prisms. The side prisms are further classified as edge prisms and corner prisms.

20

Two types of prism puzzles may be contemplated:

Type A: Prism puzzles where the vertical section planes intersect adjacent vertical faces

25

Type B: Prism puzzles where the vertical section planes intersect alternate vertical faces.

30

Generally, the central prisms are both equilateral and equiangular but, as can be shown, there are cases where this is not so. The compulsory requirement of central prism profiles is that they should have two or more degrees of symmetry. The side prism profiles may take any convenient shape, and may, if desired, have an external face that is not flat.

In the prism puzzles of the invention, each vertical section rotates through 180° only and each horizontal section rotates through an angle which depends on the number of vertical faces (or the number of degrees of symmetry) of the central prism.

The rotations of horizontal sections are:

- 120° (triangular prisms)
- 90° (square prisms)
- 72° (pentagonal prisms)
- 60° (hexagonal prisms)

The mechanical construction of the puzzles according to the invention may vary, but generally:

- (i) the central prisms are held together by a rod passing vertically through the centre of the central prisms, and
- (ii) the side prisms may be attached to the central prisms by projections fixed to the side prisms and running in circular grooves in the central prisms; or alternatively by projections fixed to the central prisms and running in circular grooves in the side prisms.

By these means, the composite prism is held together, while at the same time allowing for required rotational movement of the various sections.

Whether projections are fixed to the side prisms or the central prisms will depend on choice of design.

It will be noticed that in type B prism puzzles, the corner prisms do not share an interface with the central prisms when the puzzle is in an 'at rest' position. The corner prisms in these instances share interfaces with edge prisms.

However the principle of projections and circular grooves still holds.

10 In type B prism puzzles, when a vertical section is rotated (through 180°), the corner prisms will at some stage during this rotation share interface with central prisms.

15 Generally where two constituent prisms share a vertical interface there is a projection(s) across the interface, fixed to one prism and running in a circular groove(s) in the other.

20 Various prism dissections are shown by way of illustration in the accompanying drawings in which:

Figures 1 to 13 are diagrammatic perspective views of puzzles in accordance with the present invention and

25 Figures 14 to 20 are schematic views along the direction of the axis of the composite prism of some of the puzzles shown in the earlier Figures and some of an alternative construction.

30 Referring first to Figures 1 to 13, these show in simplified form a prism laid on its end. The lines show the edges of the individual blocks making up the prism and it can be seen that in each case a central column of

prismatic blocks is surrounded by columns of other prismatic blocks.

5 Horizontally, the overall composite prism is divided into two (Figures 1, 3, 5, 8 and 11), three (Figures 2, 4, 6, 9 and 12) or four (Figures 7, 10 and 13) layers.

10 In the case of the constructions shown in Figures 1 to 4, each column of prismatic blocks other than the central column may be rotated about a horizontal axis half way up the overall structure. These are Type A puzzles as set out above. In the case of the construction shown in Figures 5 to 13, three columns of prismatic blocks must be rotated as a whole about such an axis in order to
15 "shuffle" the blocks away from their original positions (Type B above).

20 The end configuration of the puzzle shown in Figures 1 and 2 is shown in Figure 14, that of the puzzle in Figures 3 and 4 in Figure 16, that of the puzzle shown in Figures 5 to 7 in Figure 17 and that of the puzzle shown in Figures 11 to 13 in Figure 20. Figures 15, 18 and 19 show alternative ways of dividing the overall composite prism into columns of blocks.

25 The techniques used for internal assembly are known in the art and any appropriate technique may be used, for example of the type described above. The central prismatic block in one or more internal layers can be
30 partial or skeletal in certain modes of construction.

In order to identify what the "starting position" of the components making up the puzzle is, it is appropriate to identify the external faces of the components in some

suitable fashion, e.g. by colouring them so that each side of the prism and the two ends are of different colours.

CLAIMS

1. A puzzle in the form of a set of mutually captive blocks arranged to form an overall prismatic shape,
5 wherein the blocks are arranged in two or more layers, the axis of the prismatic shape passing perpendicularly through such layers, each layer being rotatable about the axis of the prismatic shape relative to the adjacent layer(s), and wherein each layer consists of a central
10 prismatic block and a plurality of lateral blocks, sets of aligned lateral blocks being rotatable as a set about an axis perpendicular to the axis of the central prismatic blocks and half way along it, rotation through one or more amounts of 180° only preserving the
15 rotatability of the layers.
2. A puzzle according to Claim 1, wherein the sets of aligned lateral blocks have faces forming parts of two adjacent faces of the overall prismatic shape.
20
3. A puzzle according to Claim 1, wherein at least one of the external faces of the overall prismatic shape is not flat.
- 25 4. A puzzle according to any one of Claims 1 to 3 wherein the lateral blocks have key-configuration projections adapted to slide in circular key-configuration grooves formed in some of the blocks.
- 30 5. A puzzle according to any one of Claims 1 to 4 wherein the central prismatic blocks are held together on a rod aligned with the axis of the overall prismatic shape.

6. A puzzle substantially as hereinbefore described with reference to the accompanying drawings.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9500792.8

Relevant Technical Fields

- (i) UK Cl (Ed.N) A6H (HKD)
(ii) Int Cl (Ed. 6) A63F 9/08

Search Examiner
MR A T BLUNT

Date of completion of Search
8 FEBRUARY 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
1 TO 6

(ii)

Categories of documents

- | | |
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| <p>X: Document indicating lack of novelty or of inventive step.</p> <p>Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.</p> <p>A: Document indicating technological background and/or state of the art.</p> | <p>P: Document published on or after the declared priority date but before the filing date of the present application.</p> <p>E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.</p> <p>&: Member of the same patent family; corresponding document.</p> |
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Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 4667961 (ABU-SHUMAYS)	1 to 6
X	US 4586713 (ABU-SHUMAYS)	1 to 6

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